APPENDIX A

SUPPORTING CALCULATIONS

TABLE A-1
CALCULATION OF MEDIA CONCENTRATIONS AT THE LOCATION OF MAXIMUM WET DEPOSITION WITHIN THE INDUSTRIAL ZONE AND ASSUMING A SOIL MIXING DEPTH OF 1 CM

Soil Concentration due to Deposition

Soil Concentration Average over Exposure Duration

COC	Ds	tD	Cs_{tD}	ks	Cs (T_2<tD)
Lead	3.1	20	40	0.046	77.3

Variable	Decryption	Units	Value
Ds	Deposition Term	mg COC/kg soil-yr	site-specific
tD	time period over which deposition occurs (time period of combustion)	yr	20
ks	COC soil loss constant due to all proceses	yr^{-1}	site-specific

TABLE A-1 (CONTINUED)

Highest Annual Average Soil Concentration

Q	Zs	BD	Fv	Vdv	Cyv	Dywv	Dydp	Dywp	Ds
0.0756	1	1.5	0	3	0	0	0	0.61	3.1

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Vdv	Dry deposition velocity	cm/s	3	
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Dywv	Unitized yearly average wet deposition from vapor phase	s/m^2-yr	constituent- and site-specific	air modeling
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-1 (CONTINUED)

COC Soil Loss Constant

ksg	kse	ksr	ksl	ksv	ks
0	0	0.037	0.0089	0	0.046

Variable	Description	Units	Value	
ksg	COC loss constant due to biotic and abiotic degradation	yr^{-1}	constituent-specific	--
kse	COC loss constant due to soil erosion	yr^{-1}	0	Default value because of soil eroding onto the Site and away from the Site
ksr	COC loss constant due to runoff	yr^{-1}	Site-specific	
ksl	COC loss constant due to leaching	yr^{-1}	constituent- and Site-specific	
ksv	COC loss due to volatilization	yr^{-1}	0	

TABLE A-1 (CONTINUED)

COC Loss Constant due to Runoff

RO	sw	Zs	Kds	BD	ksr
50	0.2	1	900	1.5	0.037

Variable	Description	Units	Value	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900
BD	Soil bulk density	g soil/cm^3 soil	1.5	default

TABLE A-1 (CONTINUED)

COC Loss Constant due to Leaching

P	I	RO	Ev	sw	Zs	BD	Kds	ksl
102	9.5	51	48	0.2	1	1.5	900	0.0089

Variable	Description	Units	Value	
P	average annual precipitation	cm/yr	18.06 to 164.19	102 - local conditions
I	Average annual irrigation	cm/yr	1 to 100	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
Ev	Average annual evapotranspiration	cm/yr	35 to 100	48 - local conditions
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900

TABLE A-1 (CONTINUED)

Air Concentration

Q	Fv	Cyv	Cyp	Ca
0.0756	0	0	0	0.000

Q	Fv	Chv	Chp	Cacute
0.0756	0	0	0	0.000

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Cyp	Unitized yearly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Chv	Unitized hourly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Chp	Unitized hourly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-2
CALCULATION OF MEDIA CONCENTRATIONS AT THE LOCATION OF MAXIMUM WET DEPOSITION WITHIN THE RESIDENTIAL/AGRICULTURAL ZONE ASSUMING A 1 CM SOIL MIXING DEPTH

Soil Concentration due to Deposition

Soil Concentration Average over Exposure Duration

COC	Ds	tD	Cs_{tD}	ks	Cs (T_2<tD)
Lead	1.5	20	20	0.046	64.1

Variable	Decryption	Units	Value
Ds	Deposition Term	mg COC/kg soil-yr	site-specific
tD	time period over which deposition occurs (time period of combustion)	yr	20
ks	COC soil loss constant due to all proceses	yr^{-1}	site-specific

TABLE A-2 (CONTINUED)

Highest Annual Average Soil Concentration

Q	Zs	BD	Fv	Vdv	Cyv	Dywv	Dydp	Dywp	Ds
0.0756	1	1.5	0	3	0	0	0	0.30	1.53

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Vdv	Dry deposition velocity	cm/s	3	
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Dywv	Unitized yearly average wet deposition from vapor phase	s/m^2-yr	constituent- and site-specific	air modeling
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-2 (CONTINUED)

COC Soil Loss Constant

ksg	kse	ksr	ksl	ksv	ks
0	0	0.037	0.0089	0	0.046

Variable	Description	Units	Value	
ksg	COC loss constant due to biotic and abiotic degradation	yr^{-1}	constituent-specific	--
kse	COC loss constant due to soil erosion	yr^{-1}	0	Default value because of soil eroding onto the Site and away from the Site
ksr	COC loss constant due to runoff	yr^{-1}	Site-specific	
ksl	COC loss constant due to leaching	yr^{-1}	constituent- and Site-specific	
ksv	COC loss due to volatilization	yr^{-1}	0	

TABLE A-2 (CONTINUED)

COC Loss Constant due to Runoff

RO	sw	Zs	Kds	BD	ksr
50	0.2	1	900	1.5	0.037

Variable	Description	Units	Value	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	9.00E+02
BD	Soil bulk density	g soil/cm^3 soil	1.5	default

TABLE A-2 (CONTINUED)

COC Loss Constant due to Leaching

P	I	RO	Ev	sw	Zs	BD	Kds	ksl
101.6	9.5	50.8	48	0.2	1	1.5	900	0.0089

Variable	Description	Units	Value	
P	average annual precipitation	cm/yr	18.06 to 164.19	108 - local conditions
I	Average annual irrigation	cm/yr	1 to 100	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
Ev	Average annual evapotranspiration	cm/yr	35 to 100	48 - local conditions
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900

TABLE A-2 (CONTINUED)

Air Concentration

Q	Fv	Cyv	Cyp	Ca
0.0756	0	0	0	0.000

Q	Fv	Chv	Chp	Cacute
0.0756	0	0	0	0.000

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Cyp	Unitized yearly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Chv	Unitized hourly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Chp	Unitized hourly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-3
CALCULATION OF MEDIA CONCENTRATION AT THE LOCATION OF MAXIMUM WET DEPOSITION WITHIN THE RESIDENTIAL/AGRICULTURAL ZONE AND ASSUMING A SOIL MIXING DEPTH OF 20 CM

Soil Concentration due to Deposition

Soil Concentration Average over Exposure Duration

COC	Ds	tD	Cs_{tD}	ks	Cs (T_2<tD)
Lead	0.076	20	1.5	0.0023	53.4

Variable	Decryption	Units	Value
Ds	Deposition Term	mg COC/kg soil-yr	site-specific
tD	time period over which deposition occurs (time period of combustion)	yr	20
ks	COC soil loss constant due to all proceses	yr^{-1}	site-specific

TABLE A-3 (CONTINUED)

Highest Annual Average Soil Concentration

Q	Zs	BD	Fv	Vdv	Cyv	Dywv	Dydp	Dywp	Ds
0.0756	20	1.5	0	3	0	0	0	0.30	0.076

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Zs	Soil mixing zone depth	cm	20	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Vdv	Dry deposition velocity	cm/s	3	
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Dywv	Unitized yearly average wet deposition from vapor phase	s/m^2-yr	constituent- and site-specific	air modeling
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-3 (CONTINUED)

COC Soil Loss Constant

ksg	kse	ksr	ksl	ksv	ks
0	0	0.0019	0.00045	0	0.0023

Variable	Description	Units	Value	
ksg	COC loss constant due to biotic and abiotic degradation	yr^{-1}	constituent-specific	--
kse	COC loss constant due to soil erosion	yr^{-1}	0	Default value because of soil eroding onto the Site and away from the Site
ksr	COC loss constant due to runoff	yr^{-1}	Site-specific	
ksl	COC loss constant due to leaching	yr^{-1}	constituent- and Site-specific	
ksv	COC loss due to volatilization	yr^{-1}	0	

TABLE A-3 (CONTINUED)

COC Loss Constant due to Runoff

RO	sw	Zs	Kds	BD	ksr
50	0.2	20	900	1.5	0.0019

Variable	Description	Units	Value	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	20	
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900
BD	Soil bulk density	g soil/cm^3 soil	1.5	default

TABLE A-3 (CONTINUED)

COC Loss Constant due to Leaching

P	I	RO	Ev	sw	Zs	BD	Kds	ksl
101.6	9.5	51	48	0.2	20	1.5	900	0.00045

Variable	Description	Units	Value	
P	average annual precipitation	cm/yr	18.06 to 164.19	108 - local conditions
I	Average annual irrigation	cm/yr	1 to 100	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
Ev	Average annual evapotranspiration	cm/yr	35 to 100	48 - local conditions
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	20	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900

TABLE A-3 (CONTINUED)

Aboveground Produce Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd
0.0756	0	0	0.60	0.30	0.39	18	0.16	2.2	0.13

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-3 (CONTINUED)

Aboveground Produce Concentration Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{ag}	Vg_{ag}	a	Pv
0.0756	0	0	0	1	1200	0

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{ag}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
a	density of air	g/m^3	1200	

TABLE A-3 (CONTINUED)

Aboveground Produce Concentration due to Root Uptake

Cs	Br_{ag}	Pr_{ag}
53	1.36E-02	0.73

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{ag}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	1.36E-02

TABLE A-3 (CONTINUED)

Belowground Produce Concentration due to Root Uptake

Cs	$Br_{rootveg}$	$VG_{rootveg}$	Pr_{bg}
53	9.00E-03	1	4.81E-01

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
$Br_{rootveg}$	Plant-soil bioconcentration factor for belowground produce	unitless	constituent-specific	9.00E-03
$VG_{rootveg}$	Empirical correction factor for belowground produce	unitless	0.1 or 1	1

TABLE A-3 (CONTINUED)

Forage and Silage Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd (mg COC/ kg DW)
0.0756	0	0	0.6	0.303	0.39	18	0.16	2.2	0.13

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-3 (CONTINUED)

Forage and Silage Concentrations Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{forage}	Vg_{ag}	a	Pv
0.0756	0	0	0	1	1200	0

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{forage}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
a	density of air	g/m^3	1200	

TABLE A-3 (CONTINUED)

Forage and Silage Concentrations due to Root Uptake

Cs	Br_{forage}	Pr
53.41118	4.50E-02	2.40E+00

Variable	Description	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{forage}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	4.50E-02

TABLE A-3 (CONTINUED)

Beef Concentration due to Plant and Soil Ingestion

	F	Qp	P	Qs	Cs	Bs	Ba_{beef}	MF	A_{beef}
forage	1	8.8	2.5						
silage	1	2.5	2.5	0.5	53	1	3.00E-04	1	0.02
grain	1	0.48	0.85						

Variable	Description	Units	Value	
F	Fration of plant type grown on contaminated soil and ingested by the animal	unitless	1	assumed unless site-specific information is available
Qp	Quantity of plant type ingested by the animal per day	kg DW plant/day	Site- and plant-specific	
P	Concetration of COC in plant type ingested by the animal	mg/kg DW	constituent-site- and plant specific	
Qs	Quantity of soil ingested by the animal	kg/day	0.5	recommended
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Bs	Soil bioavailability factor	unitless	1	recommended
Ba_{beef}	Biotransfer factor for beef	day/kg FW tissue	constituent-specific	3.00E-04
MF	Metabolism factor	unitless	constituent-specific	1

TABLE A-3 (CONTINUED)

Air Concentration

Q	Fv	Cyv	Cyp	Ca
0.0756	0	0	0	0.000

Q	Fv	Chv	Chp	Cacute
0.0756	0	0	0	0.000

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	$\mu g\text{-}s/g\text{-}m^3$	constituent- and site-specific	air modeling
Cyp	Unitized yearly average air concentration from particle phase	$s/m^2\text{-}yr$	constituent- and site-specific	air modeling
Chv	Unitized hourly average air concentration from vapor phase	$\mu g\text{-}s/g\text{-}m^3$	constituent- and site-specific	air modeling
Chp	Unitized hourly average air concentration from particle phase	$s/m^2\text{-}yr$	constituent- and site-specific	air modeling

TABLE A-4
CALCULATION OF MEDIA CONCENTRATIONS AT THE LOCATION OF MAXIMUM DRY DEPOSITION WITHIN THE RESIDENTIAL/AGRICULTURAL ZONE ASSUMING A SOIL MIXING DEPTH OF 1 CM

Soil Concentration due to Deposition

Soil Concentration Average over Exposure Duration

COC	Ds	tD	Cs_{tD}	ks	Cs (T_2<tD)
Lead	1.8	20	23	0.046	66.1

Variable	Decryption	Units	Value
Ds	Deposition Term	mg COC/kg soil-yr	site-specific
tD	time period over which deposition occurs (time period of combustion)	yr	20
ks	COC soil loss constant due to all proceses	yr^{-1}	site-specific

TABLE A-4 (CONTINUED)

Highest Annual Average Soil Concentration

Q	Zs	BD	Fv	Vdv	Cyv	Dywv	Dydp	Dywp	Ds
0.0756	1	1.5	0	3	0	0	0.33	0.017	1.8

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Vdv	Dry deposition velocity	cm/s	3	
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Dywv	Unitized yearly average wet deposition from vapor phase	s/m^2-yr	constituent- and site-specific	air modeling
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-4 (CONTINUED)

COC Soil Loss Constant

ksg	kse	ksr	ksl	ksv	ks
0	0	0.037	0.0089	0	0.046

Variable	Description	Units	Value	
ksg	COC loss constant due to biotic and abiotic degradation	yr^{-1}	constituent-specific	--
kse	COC loss constant due to soil erosion	yr^{-1}	0	Default value because of soil eroding onto the Site and away from the Site
ksr	COC loss constant due to runoff	yr^{-1}	Site-specific	
ksl	COC loss constant due to leaching	yr^{-1}	constituent- and Site-specific	
ksv	COC loss due to volatilization	yr^{-1}	0	

TABLE A-4 (CONTINUED)

COC Loss Constant due to Runoff

RO	sw	Zs	Kds	BD	ksr
50	0.2	1	900	1.5	0.037

Variable	Description	Units	Value	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900
BD	Soil bulk density	g soil/cm^3 soil	1.5	default

TABLE A-4 (CONTINUED)

COC Loss Constant due to Leaching

P	I	RO	Ev	sw	Zs	BD	Kds	ksl
102	9.5	51	48	0.2	1	1.5	900	0.0089

Variable	Description	Units	Value	
P	average annual precipitation	cm/yr	18.06 to 164.19	108 - local conditions
I	Average annual irrigation	cm/yr	1 to 100	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
Ev	Average annual evapotranspiration	cm/yr	35 to 100	48 - local conditions
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	1	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900

TABLE A-4 (CONTINUED)

Aboveground Produce Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd
0.0756	0	0.33	0.6	0.017	0.39	18	0.16	2.2	0

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-4 (CONTINUED)

Aboveground Produce Concentration Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{ag}	Vg_{ag}	$_a$	Pv
0.0756	0	0	0	1	1200	0

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{ag}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
$_a$	density of air	g/m^3	1200	

TABLE A-4 (CONTINUED)

Aboveground Produce Concentration due to Root Uptake

Cs	Br_{ag}	Pr_{ag}
66	1.36E-02	8.99E-01

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{ag}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	1.36E-02

TABLE A-4 (CONTINUED)

Belowground Produce Concentration due to Root Uptake

Cs	$Br_{rootveg}$	$VG_{rootveg}$	Pr_{bg}
66	9.00E-03	1	5.95E-01

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
$Br_{rootveg}$	Plant-soil bioconcentration factor for belowground produce	unitless	constituent-specific	9.00E-03
$VG_{rootveg}$	Empirical correction factor for belowground produce	unitless	0.1 or 1	1

TABLE A-4 (CONTINUED)

Forage and Silage Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd (mg COC/ kg DW)
0.0756	0	0.3317	0.6	0.0167	0.39	18	0.164	2.24	0.24

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-4 (CONTINUED)

Forage and Silage Concentrations Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{forage}	Vg_{ag}	a	Pv
0.0756	0	0	0	1	1200	0

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{forage}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
a	density of air	g/m^3	1200	

TABLE A-4 (CONTINUED)

Forage and Silage Concentrations due to Root Uptake

Cs	Br_{forage}	Pr
66.08517	4.50E-02	2.97E+00

Variable	Description	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{forage}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	4.50E-02

TABLE A-4 (CONTINUED)

Beef Concentration due to Plant and Soil Ingestion

	F	Qp	P	Qs	Cs	Bs	Ba_{beef}	MF	A_{beef}
forage	1	8.8	3.21						
silage	1	2.5	3.21	0.5	66	1	3.00E-04	1	0.02
grain	1	0.48	1.14						

Variable	Description	Units	Value	
F	Fration of plant type grown on contaminated soil and ingested by the animal	unitless	1	assumed unless site-specific information is available
Qp	Quantity of plant type ingested by the animal per day	kg DW plant/day	Site- and plant-specific	
P	Concetration of COC in plant type ingested by the animal	mg/kg DW	constituent-site- and plant specific	
Qs	Quantity of soil ingested by the animal	kg/day	0.5	recommended
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Bs	Soil bioavailability factor	unitless	1	recommended
Ba_{beef}	Biotransfer factor for beef	day/kg FW tissue	constituent-specific	3.00E-04
MF	Metabolism factor	unitless	constituent-specific	1

TABLE A-4 (CONTINUED)

Air Concentration

Q	Fv	Cyv	Cyp	Ca
0.0756	0	0	0.522	0.039

Q	Fv	Chv	Chp	Cacute
0.0756	0	0	0.522	0.039

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Cyp	Unitized yearly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Chv	Unitized hourly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Chp	Unitized hourly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-5
CALCULATION OF MEDIA CONCENTRATIONS AT THE LOCATION OF MAXIMUM DRY DEPOSITION WITHIN THE RESIDENTIAL/AGRICULTRURAL ZONE ASSUMING A SOIL MIXING DEPTH OF 20 CM

Soil Concentration due to Deposition

Soil Concentration Average over Exposure Duration

COC	Ds	tD	Cs_{tD}	ks	Cs (T_2<tD)
Lead	0.088	20	1.7	0.0023	53.8

Variable	Decryption	Units	Value
Ds	Deposition Term	mg COC/kg soil-yr	site-specific
tD	time period over which deposition occurs (time period of combustion)	yr	20
ks	COC soil loss constant due to all proceses	yr^{-1}	site-specific

TABLE A-5 (CONTINUED)

Highest Annual Average Soil Concentration

Q	Zs	BD	Fv	Vdv	Cyv	Dywv	Dydp	Dywp	Ds
0.0756	20	1.5	0	3	0	0	0.33	0.017	0.088

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Zs	Soil mixing zone depth	cm	20	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Vdv	Dry deposition velocity	cm/s	3	
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Dywv	Unitized yearly average wet deposition from vapor phase	s/m^2-yr	constituent- and site-specific	air modeling
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling

TABLE A-5 (CONTINUED)

COC Soil Loss Constant

ksg	kse	ksr	ksl	ksv	ks
0	0	0.0019	0.00045	0	0.0023

Variable	Description	Units	Value	
ksg	COC loss constant due to biotic and abiotic degradation	yr^{-1}	constituent-specific	--
kse	COC loss constant due to soil erosion	yr^{-1}	0	Default value because of soil eroding onto the Site and away from the Site
ksr	COC loss constant due to runoff	yr^{-1}	Site-specific	
ksl	COC loss constant due to leaching	yr^{-1}	constituent- and Site-specific	
ksv	COC loss due to volatilization	yr^{-1}	0	

TABLE A-5 (CONTINUED)

COC Loss Constant due to Runoff

RO	sw	Zs	Kds	BD	ksr
50	0.2	20	900	1.5	0.0019

Variable	Description	Units	Value	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	20	
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900
BD	Soil bulk density	g soil/cm^3 soil	1.5	default

TABLE A-5 (CONTINUED)

COC Loss Constant due to Leaching

P	I	RO	Ev	sw	Zs	BD	Kds	ksl
102	9.5	51	48	0.2	20	1.5	9.00E+02	0.00045

Variable	Description	Units	Value	
P	average annual precipitation	cm/yr	18.06 to 164.19	102 - local conditions
I	Average annual irrigation	cm/yr	1 to 100	
RO	Average annual surface runoff from previous areas	cm/yr	Site-specific	
Ev	Average annual evapotranspiration	cm/yr	35 to 100	48 - local conditions
sw	Soil volumetric water content	mL water/ cm^3 soil	0.2	default
Zs	Soil mixing zone depth	cm	20	
BD	Soil bulk density	g soil/cm^3 soil	1.5	default
Kds	Soil-water partition coefficient	mL water/ g soil	constituent-specific	900

TABLE A-5 (CONTINUED)

Aboveground Produce Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd
0.0756	0	0.33	0.6	0.017	0.39	18	0.16	2.2	0

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-5 (CONTINUED)

Aboveground Produce Concentration Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{ag}	Vg_{ag}	a	Pv
0.0756	0	0	0	1	1200	0

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{ag}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
a	density of air	g/m^3	1200	

TABLE A-5 (CONTINUED)

Aboveground Produce Concentration due to Root Uptake

Cs	Br_{ag}	Pr_{ag}
53.8	1.36E-02	7.31E-01

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{ag}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	1.36E-02

TABLE A-5 (CONTINUED)

Belowground Produce Concentration due to Root Uptake

Cs	$Br_{rootveg}$	$VG_{rootveg}$	Pr_{bg}
53.8	9.00E-03	1	4.84E-01

Variable	Decription	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
$Br_{rootveg}$	Plant-soil bioconcentration factor for belowground produce	unitless	constituent-specific	9.00E-03
$VG_{rootveg}$	Empirical correction factor for belowground produce	unitless	0.1 or 1	1

TABLE A-5 (CONTINUED)

Forage and Silage Concentration due to Direct Deposition

Q	Fv	Dydp	Fw	Dywp	Rp	kp	Tp	Yp	Pd (mg COC/ kg DW)
0.0756	0	0.33	0.6	0.017	0.39	18	0.16	2.2	0.24

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Dydp	Unitized yearly average dry deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Dywp	Unitized yearly average det deposition from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Rp	Interception fraction of the edible portion of plant	unitless	0.39	default
Fw	Fraction of COC wet deposition that adheres to plant surfaces	unitless	0.6	value for cations and most organics
kp	Plant surface loss coefficient	yr^{-1}	18	recommended
Tp	Length of plant exposure to deposition per harvest of edible portion of plant	yr-1	0.164	recommended
Yp	Yield or standing crop biomass of the edible portion of the plant (productivity)	kg DW/m^2	2.24	recommended value for above ground produce

TABLE A-5 (CONTINUED)

Forage and Silage Concentrations Due to Air-to-Plant Transfer

Q	Fv	Cyv	Bv_{forage}	Vg_{ag}	a	Pv
0.0756	0	0	0	1	1200	0

Variable	Description	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Bv_{forage}	COC air-to-plant biotransfer factor for aboveground produce	unitless	constituent-specific	0 for metals
Vg_{ag}	Empirical correction factor for aboveground produce	unitless	constituent-specific	--
a	density of air	g/m^3	1200	

TABLE A-5 (CONTINUED)

Forage and Silage Concentrations due to Root Uptake

Cs	Br_{forage}	Pr
53.77246	4.50E-02	2.4

Variable	Description	Units	Value	
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Br_{forage}	Plant-soil bioconcentration factor for aboveground produce	unitless	constituent-specific	4.50E-02

TABLE A-5 (CONTINUED)

Beef Concentration due to Plant and Soil Ingestion

	F	Qp	P	Qs	Cs	Bs	Ba_{beef}	MF	A_{beef}
forage	1	8.8	2.66						
silage	1	2.5	2.66	0.5	54	1	3.00E-04	1	0.02
grain	1	0.48	0.97						

Variable	Description	Units	Value	
F	Fration of plant type grown on contaminated soil and ingested by the animal	unitless	1	assumed unless site-specific information is available
Qp	Quantity of plant type ingested by the animal per day	kg DW plant/day	Site- and plant-specific	
P	Concetration of COC in plant type ingested by the animal	mg/kg DW	constituent-site- and plant specific	
Qs	Quantity of soil ingested by the animal	kg/day	0.5	recommended
Cs	Average soil concentration over exposure duration	mg COC/kg soil	consituent- and site-specific	
Bs	Soil bioavailability factor	unitless	1	recommended
Ba_{beef}	Biotransfer factor for beef	day/kg FW tissue	constituent-specific	3.00E-04
MF	Metabolism factor	unitless	constituent-specific	1

TABLE A-5 (CONTINUED)

Air Concentration

Q	Fv	Cyv	Cyp	Ca
0.0756	0	0	0.522	0.039

Q	Fv	Chv	Chp	Cacute
0.0756	0	0	0.522	0.039

Variable	Decription	Units	Value	
Q	COC-specific emission rate	g/s	site-specific	
Fv	Fraction of COC air concentration in vapor phase	unitless	constituent-specific	0% for metals
Cyv	Unitized yearly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Cyp	Unitized yearly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling
Chv	Unitized hourly average air concentration from vapor phase	µg-s/g-m^3	constituent- and site-specific	air modeling
Chp	Unitized hourly average air concentration from particle phase	s/m^2-yr	constituent- and site-specific	air modeling